

## CLAIMS

1. A method of producing megakaryocytes *in vitro* comprising co-culturing human mesenchymal stem cells with CD34+ cells to induce the CD34+ cells to differentiate into megakaryocytes.
2. The method of claim 1 wherein the mesenchymal stem cell population is allogeneic or autologous to the hematopoietic progenitor cell population.
3. The method of claim 1 wherein the cells are in close physical association in a monolayer.
4. A method for treating a patient in need of megakaryocytes, comprising administering to the patient human mesenchymal stem cells in an amount effective to produce megakaryocytes.
5. A method for treating a patient in need of megakaryocytes comprising administering to the patient mesenchymal stem cells and CD34+ cells in an amount effective to produce megakaryocytes.
6. A method of producing genetically modified megakaryocytes, comprising transducing hematopoietic progenitor cells with exogenous genetic material; and culturing the transduced hematopoietic cells in the presence of mesenchymal stem cells to induce differentiation of the transduced hematopoietic cells into megakaryocytes which contain the exogenous genetic material.
7. A composition of genetically modified megakaryocytes.
8. A composition of genetically modified platelets.